

CHICAGO FORECAST DISTRICT.

During the first half of October frost warnings were issued for that portion of the Chicago forecast district lying east of the Rocky Mountains on the 1st, 2d, 3d, 4th, 5th, 7th, 11th, and 12th, frosts being most general on the 3d, 4th, 8th, 12th, and 13th. On the 12th, killing frost was reported as far south as eastern Kansas and western and central Missouri. During the balance of the month the temperature was generally above the seasonal average throughout the district and no frost warnings were necessary.

On October 25 stock advices were issued for western Kansas.

The cranberry marsh season in Wisconsin terminated on October 4, but on October 1 and 3 frost warnings were issued, the lowest readings of the season with killing frost being reported on the morning of the 3d, 15° being registered on the marsh at Shell Lake, in the northwestern part of the State, and 19° at the marshes located in the central portion.

Special daily fire-weather warnings and forecasts were sent to the State Forester at St. Paul, Minn., from the beginning of the month to October 21, the service being discontinued on the latter date.—*E. H. Haines.*

NEW ORLEANS FORECAST DISTRICT.

No storm which would have called for warnings occurred along the middle and west Gulf coast during the month, and no warnings were displayed except at Burrwood and Pilotown on the 24th.

No cold waves occurred and no warnings were issued. Light frost occurred in some parts of the northern portion of the district on the 4th, 5th, 9th, 12th, 13th, 15th, 21st, and 27th, for which warnings were issued. A light frost occurred over the northern portion of the district on the 8th without warning, due to a more rapid movement southward of an area of high pressure than was anticipated.—*I. M. Cline.*

DENVER FORECAST DISTRICT.

The month was unusually free from storms, and the precipitation was below the normal, except in parts of Utah. Remarkably warm weather prevailed throughout the district during the greater part of the month. Freezing temperature or killing-frost warnings were required, however, on several dates.

An anticyclonic area of considerable intensity appeared over the Province of Alberta on the 6th and moved rapidly southward along the eastern slope. It was anticipated that cloudy weather would prevail on the eastern slope on the morning of the 7th, and cloudy weather was reported, except in the extreme northern part of eastern Colorado where the weather cleared by morning and frost occurred. Warnings of freezing temperature or killing frost were also issued for eastern Colorado and frost for northern New Mexico on the morning of the 7th. A killing frost was reported at Pueblo and heavy frost at Santa Fe. Freezing temperature or frost was forecast for eastern Colorado and frost for northern New Mexico on the morning of the 11th, when an anticyclonic area occupied the eastern slope. Frost temperatures occurred in the area indicated. After a prolonged period of fair weather, a disturbance apparently formed over southern Nevada on the 21st and did not pass out of the district until four

days later. On the 24th it occupied the Rocky Mountain region, with centers in northern Arizona and north-central Colorado. Freezing temperature warnings were issued for the western, fruit valleys of Colorado and for northern Arizona and the greater part of northern New Mexico and freezing temperature or killing-frost warnings for Utah. Freezing temperature occurred in the area indicated, with a killing frost at Modena, Utah. Warnings of freezing temperature or killing frost were repeated for the same area and extended to eastern Colorado on the morning of the 25th. Killing frosts were reported in the remainder of Utah and the western valleys of Colorado and freezing temperature in the remainder of the region for which the warnings were issued. A temperature of 38° was reported at Roswell, with clear sky. Although the barometer did not rise on the 27th the temperature fell to 34° at Roswell and a killing frost was reported. Warnings of local frost were issued for New Mexico on the 30th. Frost temperatures were reported throughout the State on the 31st.—*Frederick W. Brist.*

SAN FRANCISCO FORECAST DISTRICT.

The month opened with quite heavy rain in southern California; and scattered light rains occurred in California and southern Nevada during the first week.

The pressure continued comparatively low over Alaska throughout the month, and consequently the storms from the north Pacific passed inland at a high latitude, the rain areas seldom extending south of the Siskiyou mountains or into the Plateau region.

On the 12th, a storm moved southeastwardly from the north Pacific, giving rain and strong southerly gales on the northern coast. From this time until the end of the month, storms of the Alaskan type moved southeastwardly at short intervals, but seldom affected the weather south of Cape Blanco. Many vessel reports were received by radio, and all tended to show very stormy conditions in the north Pacific during the latter half of the month. The Japanese S. S. *Fukui Maru* was seriously damaged in one of these gales and sank on the night of the 26th, about 350 miles off Cape Flattery. All passengers and crew were saved by the S. S. *West Ivan*.

Storm warnings were ordered 11 times during the month and were generally verified. Reports at sea showed them all to be justified.

Special rain warnings were issued in northern California on the 3d and 12th.

A period of warm weather prevailed over the southern half of this district from the 17th to the 20th, and on the 18th the record for high temperature in October was broken at San Luis Obispo and Tonopah.

During the storm of the 26th a small tornado occurred in the suburbs of Sacramento, slightly injuring five persons, unroofing several buildings and causing damage estimated at about \$17,000.—*G. H. Willson.*

RIVERS AND FLOODS.

By H. O. FRANKENFIELD, Meteorologist.

Normal October low-water conditions were accentuated by the prevailing drought throughout the month, and only two minor floods were reported. On the first day of the month the Santee River at Rimini, S. C., reached the flood stage of 12 feet from local rains, with the upper river falling at the same time. No damage

was done. On the last day of the month there was a short flood in the upper waters of the Roanoke River, due to a heavy two-day rain, and considerable local damage resulted.

In the Southeastern States the water shortage became so acute as to necessitate the shutting down of many hydroelectric plants, and in some instances the overland hauling of water for steam purposes.

The daily forecasts of stages of water in the great rivers of the country have taken on an added importance by reason of the impetus recently given to river transportation through the extension of the barge service on the Mississippi and Ohio Rivers. On October 27, 1921, a fleet of 10 barges, carrying 8,000 tons of steel products, departed from Pittsburgh, Pa., for St. Louis, Mo., and extensions of the service north of St. Louis and further extensions south of Cairo, Ill., are planned for the near future.

The barges have a net tonnage of from 800 to 1,000 tons, and will probably have a draft of only 4 feet of water. The towboats will have about the same draft.

EFFECT OF WEATHER ON CROPS AND FARMING OPERATIONS: OCTOBER, 1921.

By J. WARREN SMITH, Meteorologist.

The first half of October was cool for the season in the eastern half of the country, but for the month as a whole temperatures were above normal in nearly all sections. Some frost damage was done to tender vegetation during the first decade, and near the middle of the month killing frost occurred as far south as the northern portions of Oklahoma, Arkansas, and Tennessee, but a comparatively small amount of harm resulted, as crops were mostly mature. The month was unusually favorable for outdoor operations, except for some interruption from the upper Mississippi Valley eastward by rather frequent rainfall. From the 4th to the 25th fair weather prevailed throughout much the greater portion of the country.

The weather was more favorable for drying corn in the lower Missouri, central and upper Mississippi, and the Ohio Valley districts, and practically no damage was done by frost. Husking made satisfactory progress and, by the last decade of the month, this work was reported as well along in the Ohio Valley and about half done in Iowa. Much of the month was exceptionally favorable for drying the crop in good condition for cribbing.

Cotton bolls continued to open rapidly and the weather was very favorable for picking and ginning in all sections of the cotton belt. The rainfall early in the month was beneficial in checking deterioration in North Carolina, but little or no top crop was realized in any portion of the belt. Late cotton improved in portions of North Carolina and the yield was exceeding expectations in northern South Carolina; otherwise little or no improvement was reported in this crop during the month.

MEAN LAKE LEVELS DURING OCTOBER, 1921.

By UNITED STATES LAKE SURVEY.

[Detroit, Mich., Nov. 4, 1921.]

The following data are reported in the "Notice to Mariners" of the above date:

Date.	Lakes. ¹			
	Superior.	Michigan and Huron.	Erie.	Ontario.
Above mean sea level at New York.....	<i>Feet.</i> 602.53	<i>Feet.</i> 579.86	<i>Feet.</i> 571.79	<i>Feet.</i> 245.11
Above or below--				
Mean stage of September, 1921.....	-0.14	-0.18	-0.38	-0.32
Mean stage of October, 1921.....	-0.15	-0.69	-0.26	-0.18
Average stage for October, last 10 years..	-0.16	-0.85	-0.38	-0.71
Highest recorded October stage.....	-1.03	-3.08	-1.91	-2.70
Lowest recorded October stage.....	+0.95	+0.26	+0.99	+1.44
Average relation of the October level to:				
September level.....		-0.20	-0.30	-0.40
November level.....		+0.20	+0.30	+0.20

¹ Lake St. Clair's level: In October, 574.65 feet.

Less rain and more sunshine were favorable for seeding winter grains in the central and eastern portions of the winter-wheat belt, where frequent rains had previously caused considerable delay. Soil moisture conditions were satisfactory in the western portion of the belt during the early part of the month, but wheat in that area was unfavorably affected thereafter by dry weather, while it was generally too dry for seeding and germination from the Rocky Mountains westward and in many of the more eastern districts. The drought had become especially severe by the close of the month in the southwestern Great Plains, including most of western Kansas, and from Oklahoma and southeastern Colorado southward, where it was too dry for seeding and germination, and the wheat that was up showed steady deterioration.

Conditions were favorable for meadows, pastures, and late truck in the interior valley districts, but lack of moisture was harmful in most of the South, the Southwest, and many western localities. Frost did some damage to late truck in California the latter part of the month, while at the same time sugar cane was considerably damaged in parts of Florida by heavy rains and high winds.

The weather was generally favorable for fruit, except that heavy damage resulted to citrus fruit in parts of Florida from the tropical storm of the 25th and 26th. (See pp. 567-570 of this REVIEW.)